

Biology Chapter 1

The Science of Life
and the God of Life

1A God & Science

Science: facts gathered
by observing the physical universe.

Fact: something that is true

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Truth: What everybody believes?

The Doctrine of Humors

- from Hippocrates (Greek, 350 BC)
- living things are composed of 4 humors:
blood, phlegm, black & yellow bile
- sickness results if humors are not balanced

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Truth: A hunch that works?

The Doctrine of Signatures

- ancient Babylonians (14th & 15th century)
- when God cursed a man with disease he had mercy & left signs for cures
- Ex: yellow lichens to treat jaundice

They sometimes worked!

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Truth: Repeated observations?

Spontaneous Generation

- (800 yr before Christ)
- Life from dead material
- From an **infusion** (boiled plant or animal matter) **microbes** would grow



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Truth: What is logical?

Inductive reasoning

- General conclusion from observed facts
- Warning! Observations may be faulty

Deductive reasoning

- Conclusions from principles believed to be truth

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Deductive reasoning **Soil becomes trees?**

- 1600s van Helmont's Experiment
- Planted 5 lb tree in 200 lb dry soil
- 5 yr later
- 164 lb tree and 199 lb soil
- Conclusion: water became tree material
- Good deductive reasoning. But WRONG!

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Truth: What is accepted by faith?

Faith = what is believed to be true

Do you believe you are a senior?

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A classification of Truth

- **Revealed truth**: recorded in scripture
- **Unrevealed truth**: natural laws
- **Theory**: thought to be true but not revealed
- **Truth by definition**: $1 + 1 = 2$
- **Fallacy**: not revealed or unrevealed truth

1B The Scientific Method

...a method of reasoning that you use daily

- ❑ Define the problem
- ❑ Do preliminary research
- ❑ Form a hypothesis
- ❑ Experiment or survey
- ❑ Collect data: recorded information
- ❑ Draw Conclusion

[video link](#)

1B The Scientific Method

Controlled Experiments

There are 2 identical groups:

Control group & Experimental Group

that only differ by a
1 thing (experimental variable)

The more variables,
the less valid (true) your results!

1B The Scientific Method

The Limits of Scientific Method

Data must be observable & measurable

Can't completely control experiment

Man's senses can be fooled (faulty equipment?)

Beliefs affect judgment

Results must be repeatable

Can't deal with values or morals

Can't prove or disprove a universal statement

Can't establish truth

Facets of Biology

Spontaneous Generation & Scientific Method

God > spontaneously created organisms
in Gen.1

Van Helmont>
Sweaty shirt &
grain form
mice?

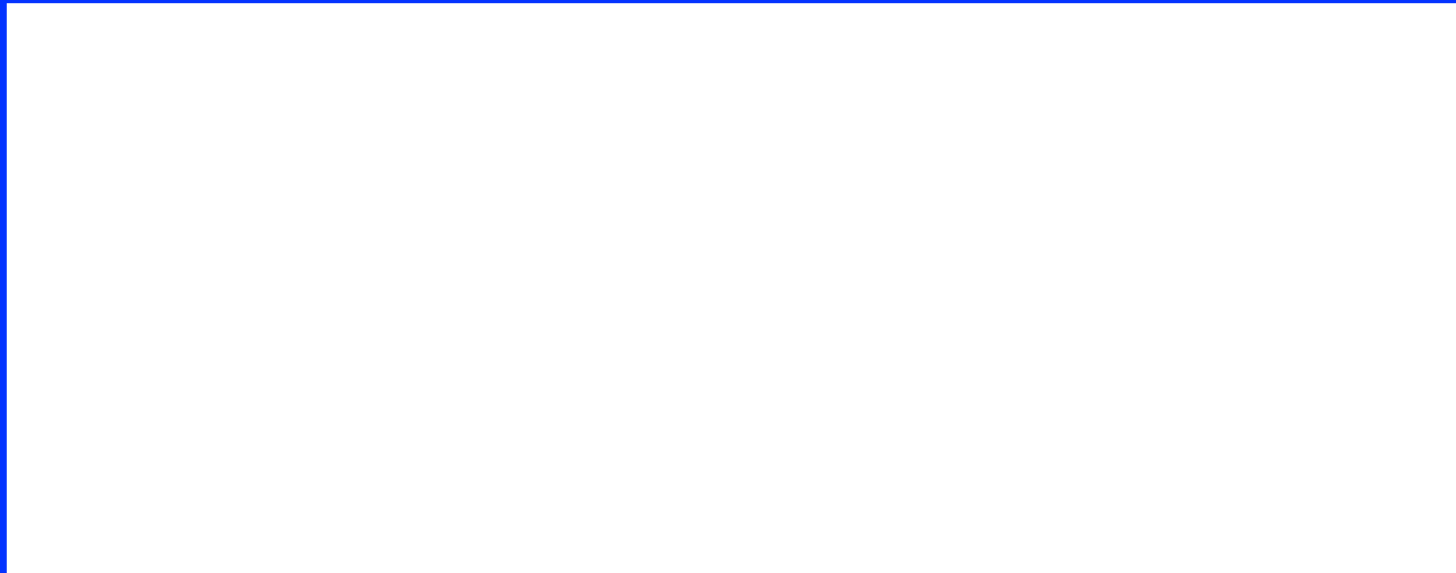


Facets of Biology



Spontaneous Generation & Scientific Method

Redi > covered jar to see if meat still became flies



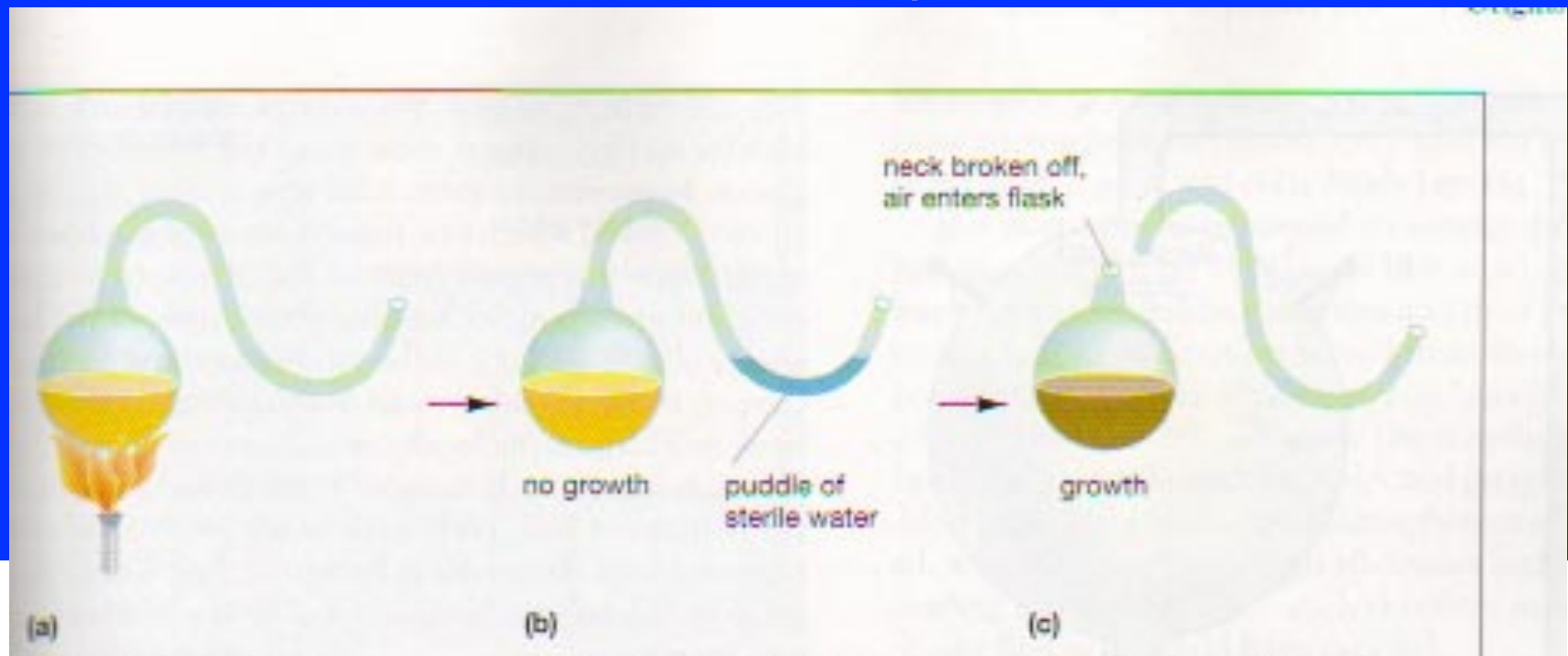
Needham > boiled infusions & microbes grew

Facets of Biology

Spontaneous Generation & Scientific Method

Spallanzani > boiled infusions longer (destroyed active principle?)

Pasteur > swan-necked flask experiment



Facets of Biology

Biogenesis: only living things
come from living things

1B The Scientific Method

Pure Science...

result of scientific activity

Applied Science

using the info from pure science

1C Biology & the Study of Life

Attributes of Life

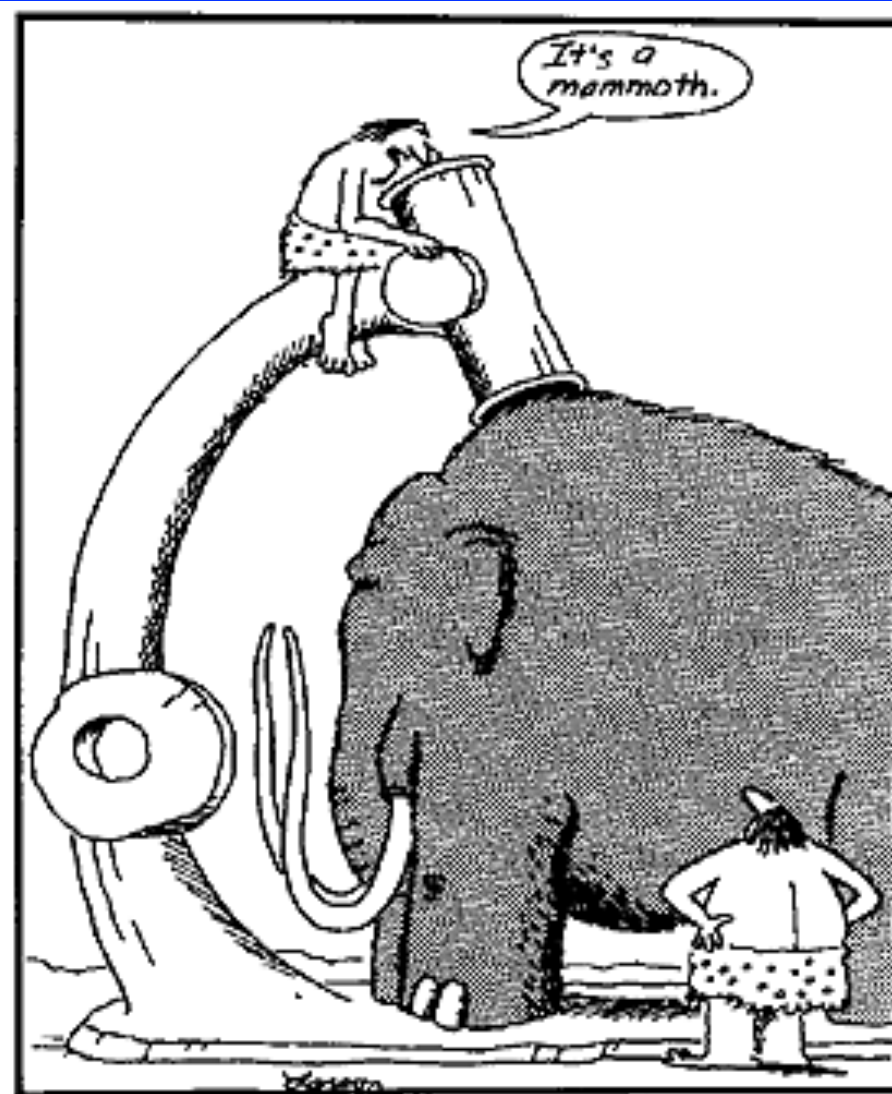
- * movement
- * grow
- * reproduces
- * come from preexisting life
- * made of **protoplasm** (with **organic** chemicals)
- * made of cells
- * **irritability**: responds to environment
- * requires energy
- * organized
- * faces death

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life ...

a highly organized cellular condition which is derived from preexisting life; requires energy to carry on processes such as growth, movement, reproduction, and responses; and faces death.

Early Microscopist

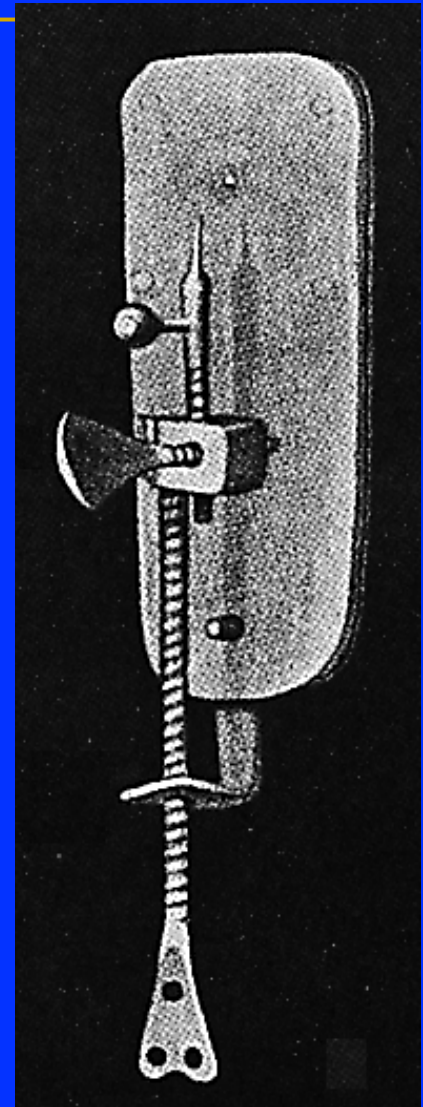


The Microscope by Maxine Kumin

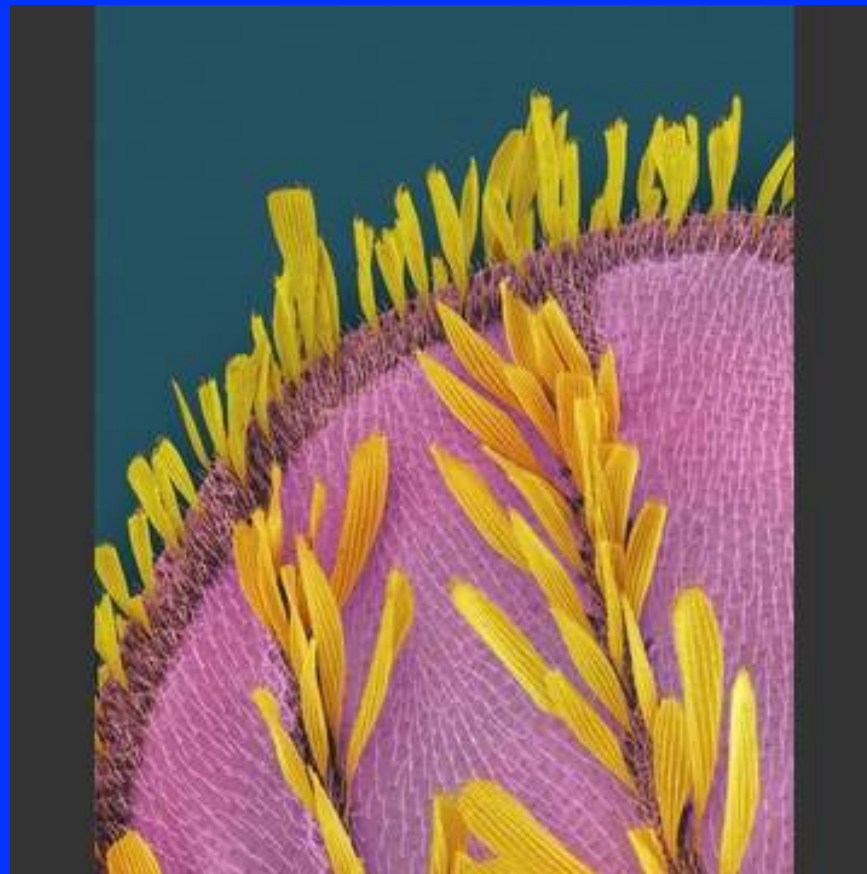


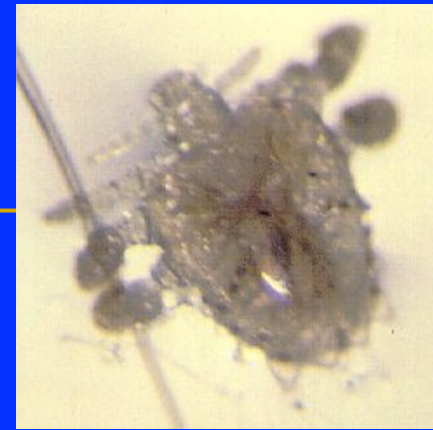
Anton van Leeuwenhoek was Dutch.
He sold pincushions, cloth, and such.
The waiting townsfolk fumed and fussed
As Anton's dry goods gathered dust.

He worked,
instead of tending store,
At grinding special lenses for
A microscope.

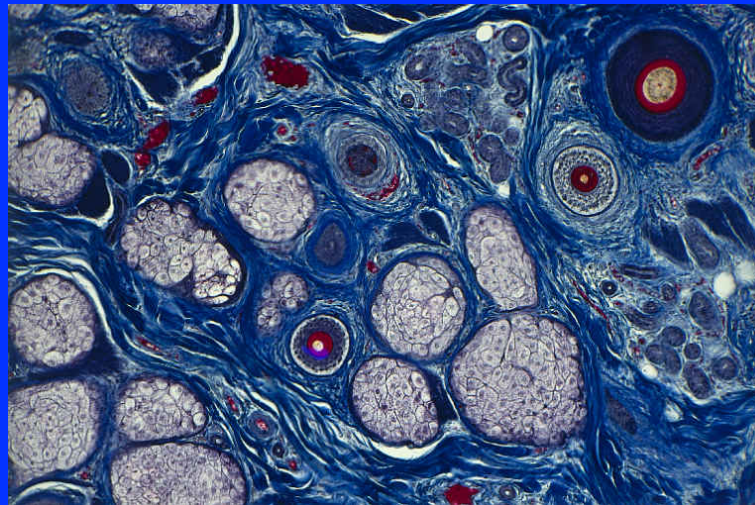


Some of the things
He looked at were: mosquitoes' wings,

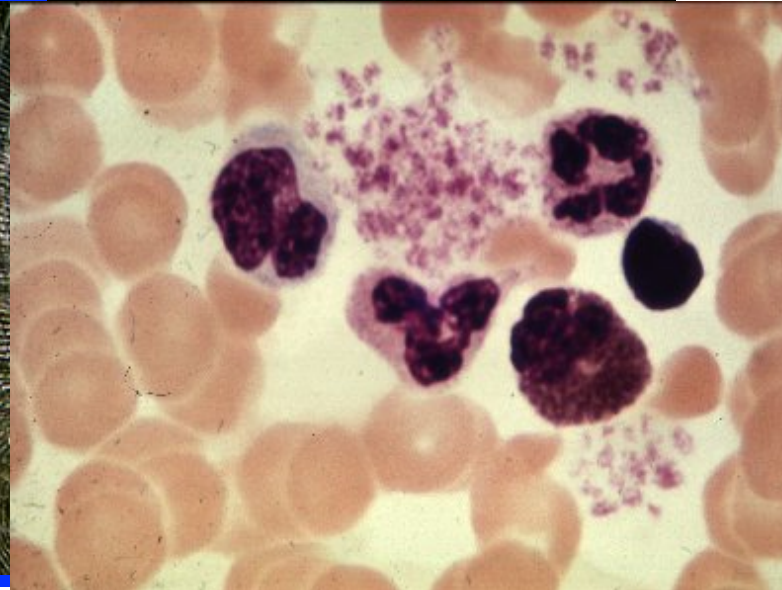




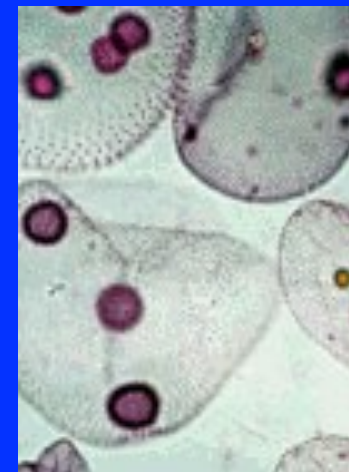
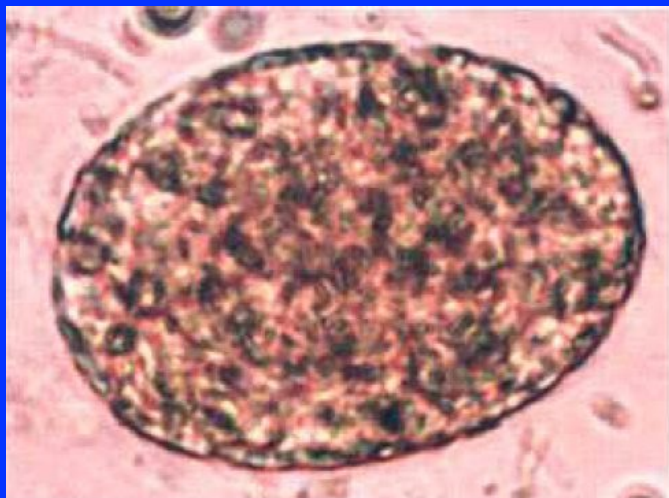
the hairs of sheep, the legs of lice,
the skin of people, dogs, and mice;



ox eyes,
spiders' spinning gear,
fishes' scales,
a little smear
of his own blood,



and best of all,
the unknown, busy, very small
bugs that swim and bump and hop
inside a simple water drop.



Impossible! Most Dutchmen said.
This Anton's crazy in the head!
He says he's seen a housefly's brain!
We ought to ship him off to Spain!



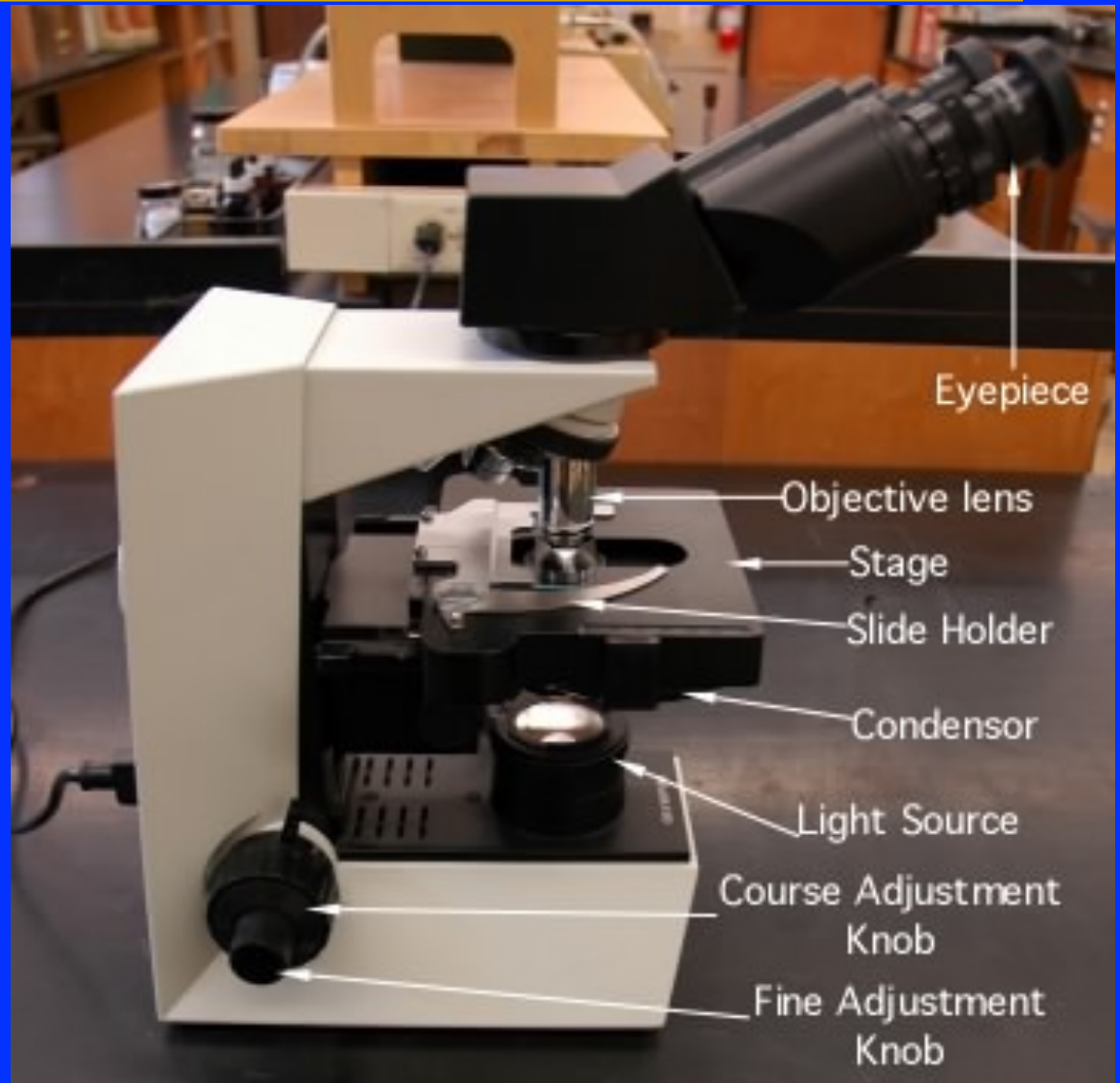
He says the water that we drink
Is full of bugs! He's mad, we think!

They called him *dumkopf*, which means dope.
That's how we got the microscope.



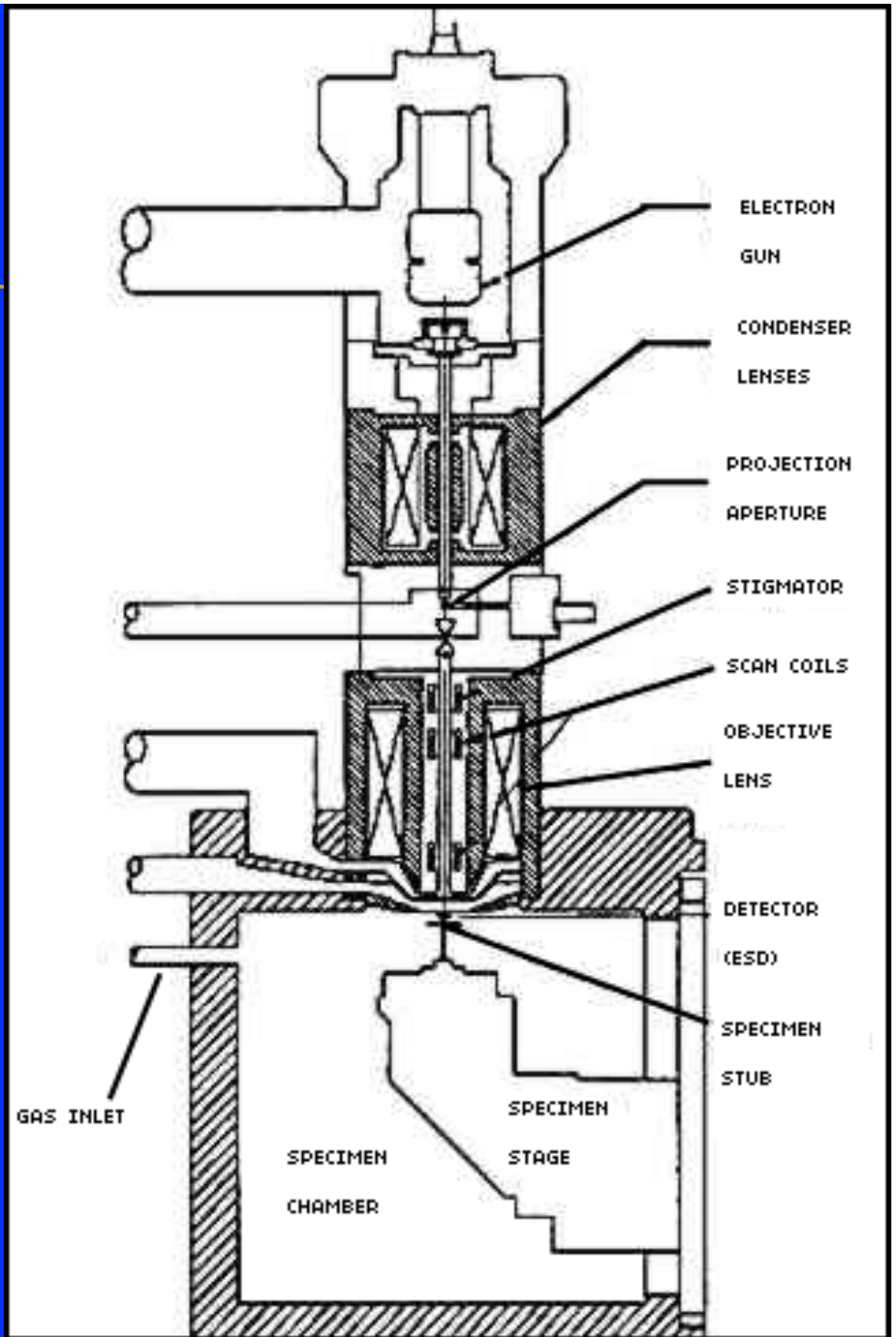
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Parts of a Compound Microscope



1C Biology video

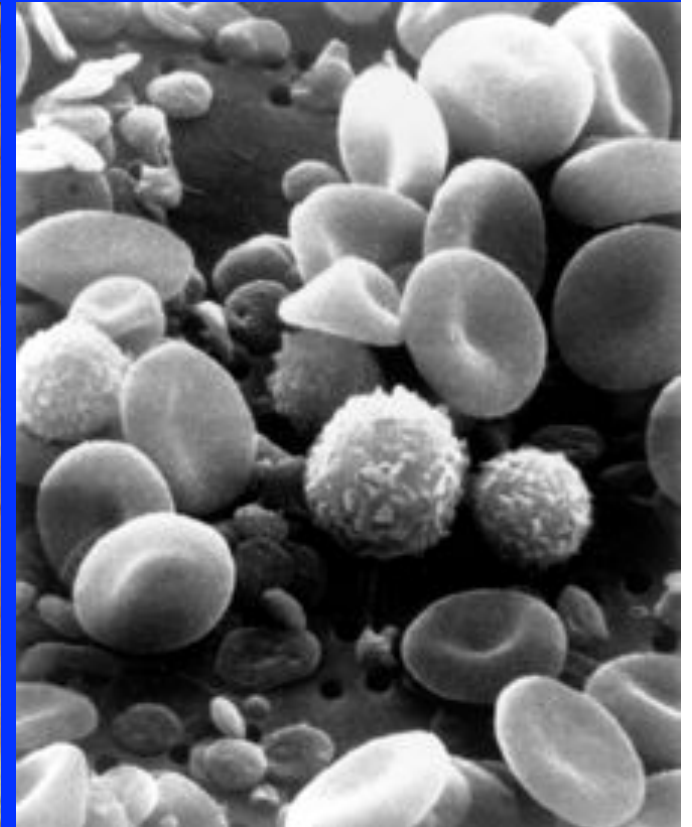
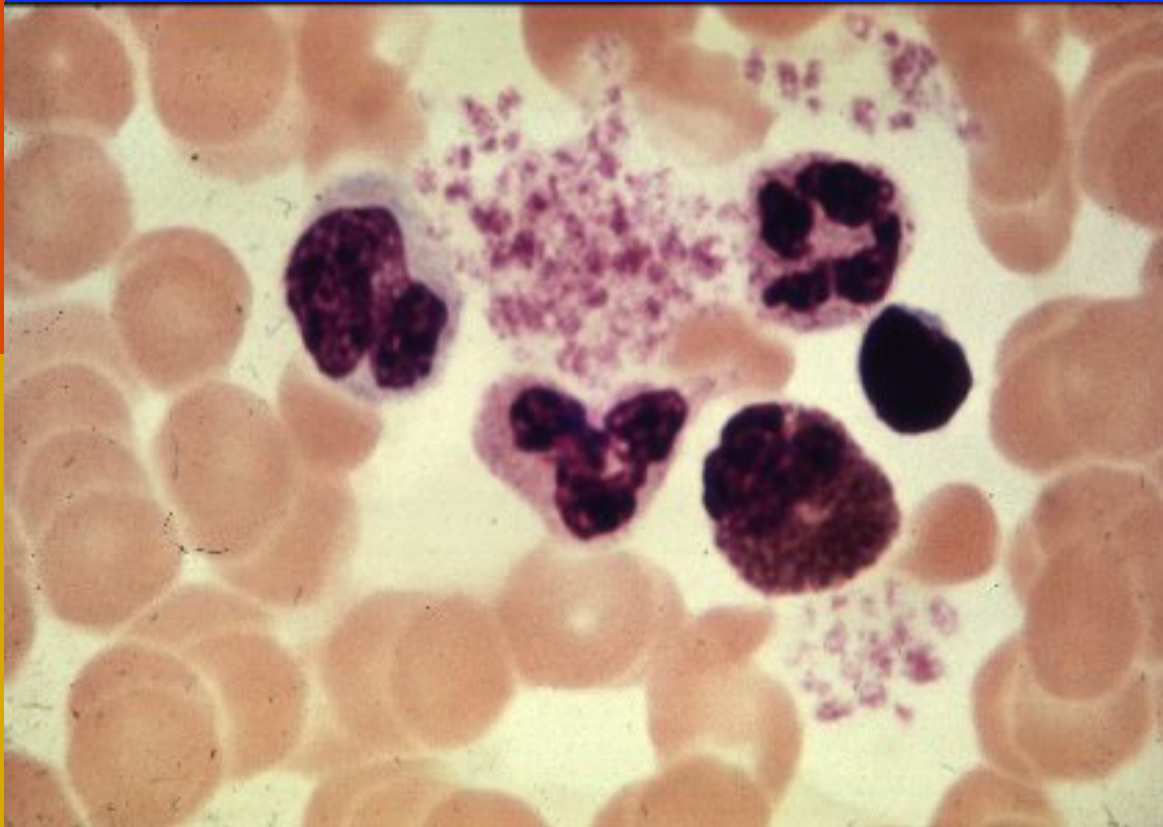
Parts of a Electron Microscope



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Compound
Electron
Microscope

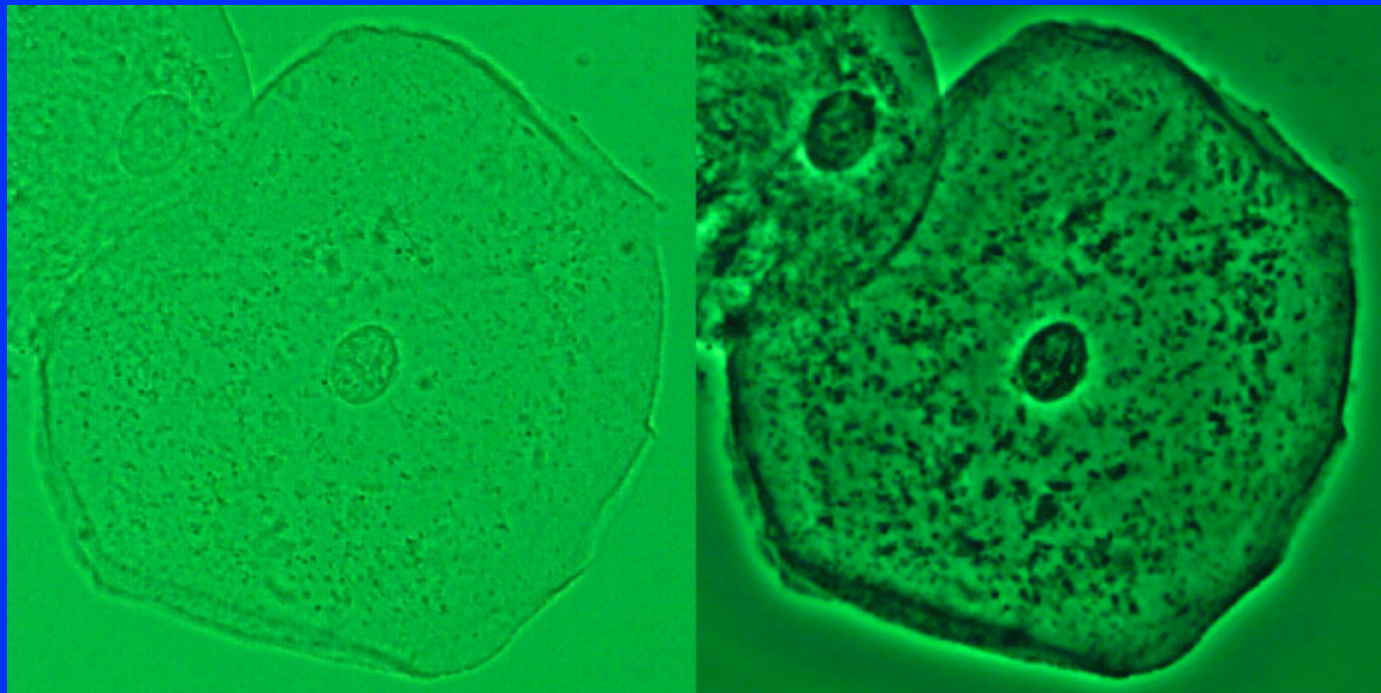
Scanning
Microscope



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Biological Research Techniques

□ staining



unstained

stained

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Biological Research Techniques

- ❑ **X-rays** pass easily through thin material and but not thick material



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Biological Research Techniques

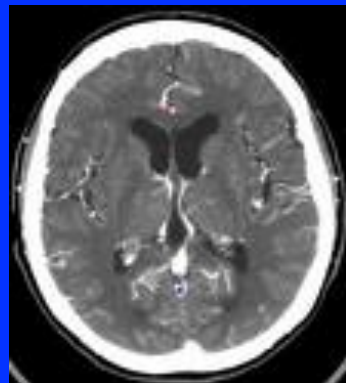
- Untrasound = sonar
bounce sound off
a structure



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Biological Research Techniques

- CT scan =
X-rays from
different
angles

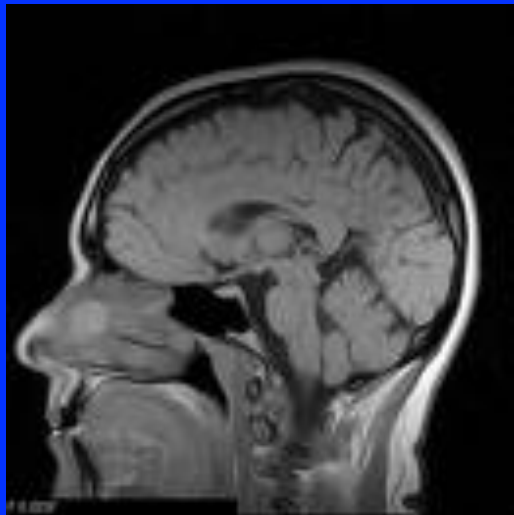


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Biological Research Techniques

□ MRI

place patient in a
magnetic field

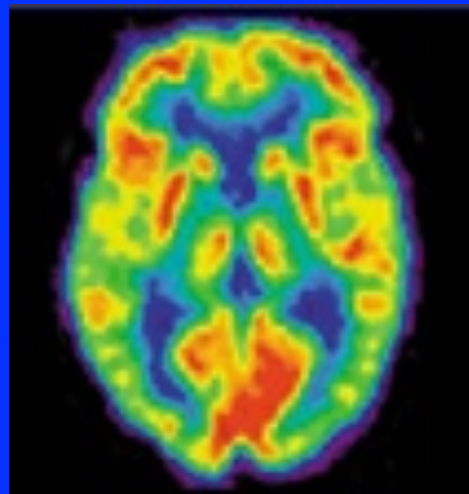


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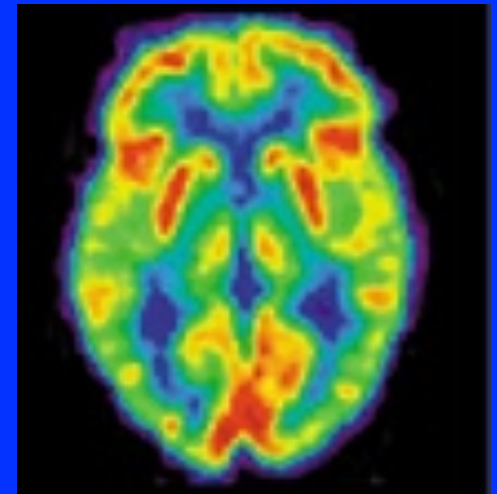
Biological Research Techniques

□ PET Scan

positrons injected
into patient
most detailed



20 year old



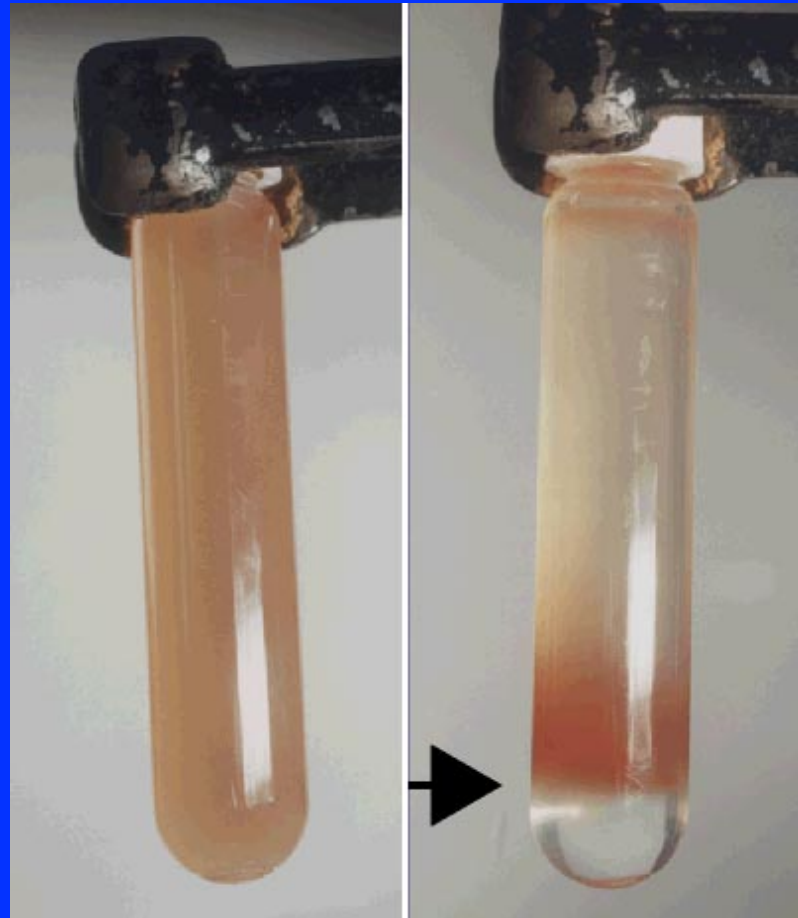
80 year old

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Biological Research Techniques

□ Cellular fractionation

This tool allows
scientists
to separate
cell components

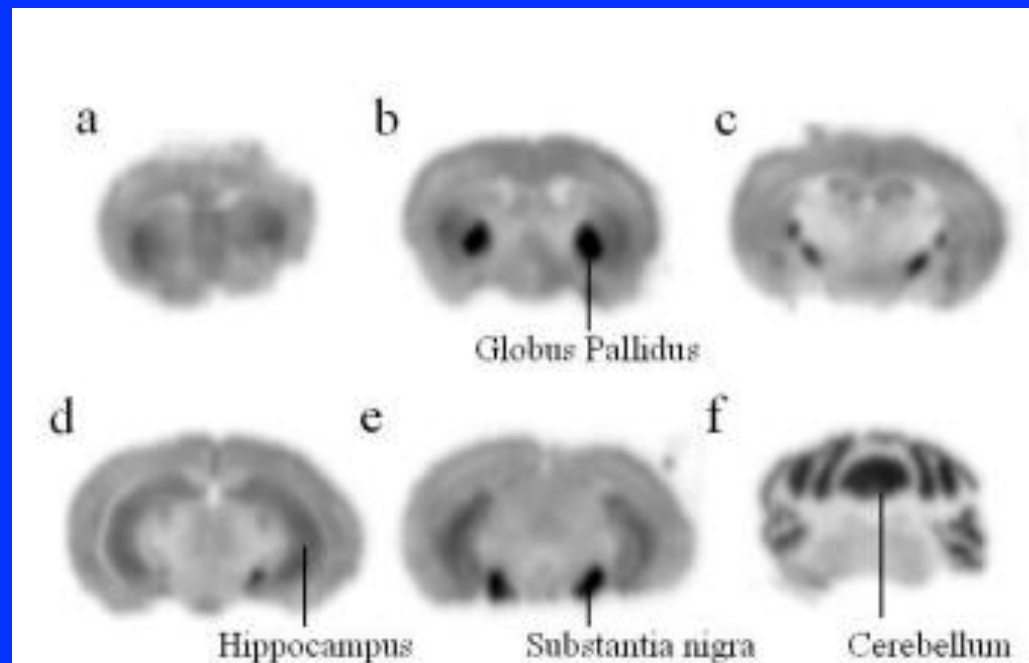


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Biological Research Techniques

□ Autoradiography

uses radioactive elements to study chemical activity



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Biological Research Techniques

- Endoscopy using a hollow tube to look inside a structure

